10CFR50.73

Virginia Electric and Power Company
North Anna Power Station
P. O. Box 402
Mineral, Virginia 23117

July 26, 2010

Attention: Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Serial No.: 10-400
NAPS: MPW
Docket No.: 50-339
License No.: NPF-7

Dear Sirs:

Pursuant to 10CFR50.73, Virginia Electric and Power Company hereby submit the following Licensee Event Report applicable to North Anna Power Station Unit 2.

Report No. 50-339/2010-002-00

This report has been reviewed by the Facility Safety Review Committee and will be forwarded to the Management Safety Review Committee for its review.

Sincerely,

N. Larry Lane
Site Vice President
North Anna Power Station

Enclosure

Commitments contained in this letter: None

cc: United States Nuclear Regulatory Commission
Region II
Marquis One Tower
245 Peachtree Center Ave., NE, Suite 1200
Atlanta, Georgia 30303-1257

NRC Senior Resident Inspector
North Anna Power Station

IE22
NRC

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES: 8/31/2010

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
NORTH ANNA POWER STATION , UNIT 2	**05000** 339	1 OF 4

4. TITLE

Automatic Reactor Trip and Engineered Safety Feature Actuation Due to Lightning Strike

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCUMENT NUMBER **05000**
05	28	2010	2010	-- 002 --	00	07	26	2010	FACILITY NAME	DOCUMENT NUMBER **05000**

9. OPERATING MODE

1

10. POWER LEVEL

100%

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	VOLUNTARY LER

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (*Include Area Code*)
F. Mladen, Director Station Safety and Licensing	(540) 894-2108

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (*If yes, complete 15. EXPECTED SUBMISSION DATE*) ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On May 28, 2010, at 0004 hours North Anna Unit 2 experienced an automatic Reactor trip from 100 percent power following a lightning strike in the switchyard. A combination of events precluded the transfer of the "B" Station Service (SS) bus to the "B" Reserve Station Service Transformer (RSST), resulting in the "B" SS bus being de-energized and a consequential loss of power to Unit 2 reactor coolant pump 1B (2-RC-P-1B). Unit 2 tripped on low flow in the "B" RCS loop. All available Engineered Safety Feature equipment responded as designed. A non-emergency 4-hour report was made to the NRC Operations Center at 0323 hours on May 28, 2010, in accordance with 10 CFR 50.72(b)(2)(iv)(B). An 8-hour report was also made in accordance with 10 CFR 50.72(b)(3)(iv)(A) due to actuation of the Auxiliary Feedwater System (AFW). This event is reportable pursuant to 10 CFR 50.73(a)(2)(iv)(A) for a condition that resulted in automatic actuation of the reactor protection system and the AFW system. This event posed no significant safety implications since the reactor protection system functioned to trip the reactor. Therefore, the health and safety of the public were not affected by this event.

1.0 DESCRIPTION OF THE EVENT

On May 28, 2010, at approximately 0004 hours, with Units 1 and 2 at full power and stable, lightning struck in the switchyard. Subsequently, Unit 2 tripped on low flow in the "B" RCS loop. All available Engineered Safety Feature (ESF) (EIIS System JE) equipment responded as designed. The post trip response progressed smoothly and the Operations crew transitioned to 2-ES-0.1, Reactor Trip without Safety Injection.

The lightning strike was on "C" phase of Bus #5 (EIIS System EA, Component Bus), which caused a differential relay actuation. This actuation caused the high side breaker for Transformer #3 (EIIS Component XFMR) to open (H302). It also caused 34.5kV breakers 252 and 34202-5 (EIIS Component BKR) to open, isolating Bus #5. This isolation resulted in the de-energization of Bus #5, which was aligned with "B" Reserve Station Service Transformer (RSST) (EIIS System EA, Component XFMR) at the time of the event.

"B" RSST provides power to "E" transfer bus (EIIS Component BUS), the 1G bus (EIIS System EA, Component BUS), and serves as an alternative power supply for Station Service (SS) buses 1B and 2B (EIIS System EA, Component BUS). Since the "B" RSST was de-energized, "E" transfer bus lost power. The 1G bus fast transfer function worked correctly and was able to obtain power from 2G bus. The "E" transfer bus is the preferred power supply for emergency bus 2H (EIIS System EB, Component BU). Emergency bus 2H then lost power, due to the loss of power to "E" transfer bus. The 2H emergency diesel generator (EIIS System EK, Component DG) was not available due to planned maintenance. Since the 2H bus lost power, no power was present on Semi-Vital Bus 2A. The loss of power to Semi-Vital bus 2A removed power to pressure differential switch 2-FW-PDS-202. This switch actuates the standby main feedwater (MFW) pump on a low pressure differential across the three MFW pumps (EIIS SJ, Component P), or on loss of power. The loss of power caused actuation of this switch, which therefore caused an auto-start of the standby MFW pump (2-FW-P-1B). A single main feedwater pump is driven by two 4500 horsepower motors, and the auto-start signal energizes both of these motors simultaneously. The magnitude of the inrush current from the simultaneous start of these two motors was large enough to reduce the "B" SS bus voltage to approximately 3000 V. This actuated the "B" SS bus undervoltage (UV) relay, whose nominal setpoint was 3043 V. This relay actuation caused "B" SS bus to attempt to transfer from its normal configuration from the "B" SS transformer (SST) to the "B" RSST, by opening breaker 25B2 and closing breaker 25B1. Breaker 25B2 did open to isolate the bus from the SST, but since the "B" RSST was isolated, breaker 25B1 did not close as designed since the bus was de-energized. This situation removed power from the "B" SS bus, and therefore the "B" reactor coolant pump (RCP). The "B" RCP began coasting down, and the reactor tripped on a less than 90 percent loop flow condition on loop B.

2.0 SIGNIFICANT SAFETY CONSEQUENCES AND IMPLICATIONS

This event posed no significant safety implications since the reactor protection system

functioned to trip the reactor. All available ESF equipment responded as designed. Therefore, the health and safety of the public were not affected by this event.

A non-emergency 4-hour report was made to the NRC Operations Center at 0323 hours on May 28, 2010, in accordance with 10 CFR 50.72 (b)(2)(iv)(B). During this call an 8-hour report was also made in accordance with 10 CFR 50.72(b)(3)(iv)(A) due to actuation of the Auxiliary Feedwater System (EIIS System-BA). This event is reportable pursuant to 10 CFR 50.73 (a)(2)(iv)(A) for a condition that resulted in automatic actuation of the reactor protection system and the AFW system

3.0 CAUSE

The cause of the Bus 5 differential relay actuation was due to a lightning strike. Inadequate overhead lightning protection did not prevent the lightning strike from contacting Bus 5. The installed arrestors are the primary lightning protection for Bus 5 which discharge to ground during a lightning strike. The longest portion of Bus 5 is underground cable to protect from overhead contact. Previous to this event, no lightning strikes in the switchyard had resulted in any loss of plant equipment.

Cause for the loss of power to the "B" SS bus is an inadequate design basis for the SS bus UV relay setpoint and the RCP bus UV relay setpoint. The SS bus UV relay setpoint has historically been set to the same value as the RCP bus UV relay setpoint. The RCP bus UV relay setpoint was originally supplied by the Westinghouse Electric Corporation document "Precautions, Limitations and Setpoints for Nuclear Steam Supply Systems", or the PLS Document. According to the PLS document, the sole basis for the RCP bus UV relay setting is to protect "the reactor against loss of main coolant flow caused by RCP motor (EIIS System-AB, Component-MO) voltage dropping lower than the pull out voltage" of the motor. The implication is that the RCP motor would be rendered inoperable following the rated pull out torque value being exceeded, which may drop to near operating levels at a certain low voltage.

At the time of the Unit 2 trip, both nominal UV setpoints were set to 3043 V. At this setting, the SS bus UV relay is vulnerable to actuation from the voltage drop associated with a large motor start. Review of the change processes that revised this setpoint shows that there had been a steady increase of this setpoint toward the 3043 V value. At no point in any of the setpoint change documentation was the possibility of setting the relay voltage too high considered. The Design Change Package (DCP) process would have driven the preparer to verify impact to the existing design basis, if any deficiencies were noted a condition report would be submitted and they would be corrected. The design basis was focused solely on the protection of the RCP motor, as it is the basis for the RCP bus UV setting. It was not focused on ensuring that the SS bus UV is not exceeded for expected bus conditions. Further, there was no basis for the SS bus UV relay to be set to the same value as the RCP bus UV. Establishing and documenting a proper design basis for both the SS bus UV relay setpoint and RCP bus UV relay setpoint will prevent recurrence of this

specific scenario, as well as similar events.

4.0 IMMEDIATE CORRECTIVE ACTION(S)

The Control Room team responded to the reactor trip in accordance with procedure 2-E-0, Reactor Trip or Safety Injection. The post trip response progressed smoothly and the Control Room team transitioned to 2-ES-0.1, Reactor Trip without Safety Injection. The Station Blackout Diesel (SBO) started and was subsequently used to supply power to the 2H emergency bus.

5.0 ADDITIONAL CORRECTIVE ACTIONS

A lightning protection scheme that provides optimum protection and least risk to switchyard equipment is being analyzed. Additional lightning protection is being evaluated for the switchyard for existing and future primary equipment.

A design basis will be developed that specifically addresses coordination between the SS bus UV setpoint and the RCP bus UV setpoint and the upper and lower bounds for each setpoint. The adjusting of these setpoints to acceptable values, based on a robust and valid design, will prevent recurrence of this specific event. The setpoint changes will also address similar events, such as the auto-start of any large motor on a SS bus.

The Unit 2 SST load tap changer (LTC) (EIIS Component PMC) settings were increased to their highest allowable values, in order to provide more margin to the SS bus UV relay actuation. The setting on the SS bus UV relay was lowered to 2912 V.

To address the extent of the lack of design basis condition, the UV and degraded voltage relay setpoints at North Anna that initiate protective functions are being investigated. The investigation will determine if an appropriate design basis exists for both the upper and lower limits of protective relay setpoints. Corrections will be made as applicable.

6.0 ACTIONS TO PREVENT RECURRENCE

The actions noted above are sufficient to preclude recurrence.

7.0 SIMILAR EVENTS

None

8.0 ADDITIONAL INFORMATION

Unit 1 was operating at 100 percent power, Mode 1, and was not affected by this event.